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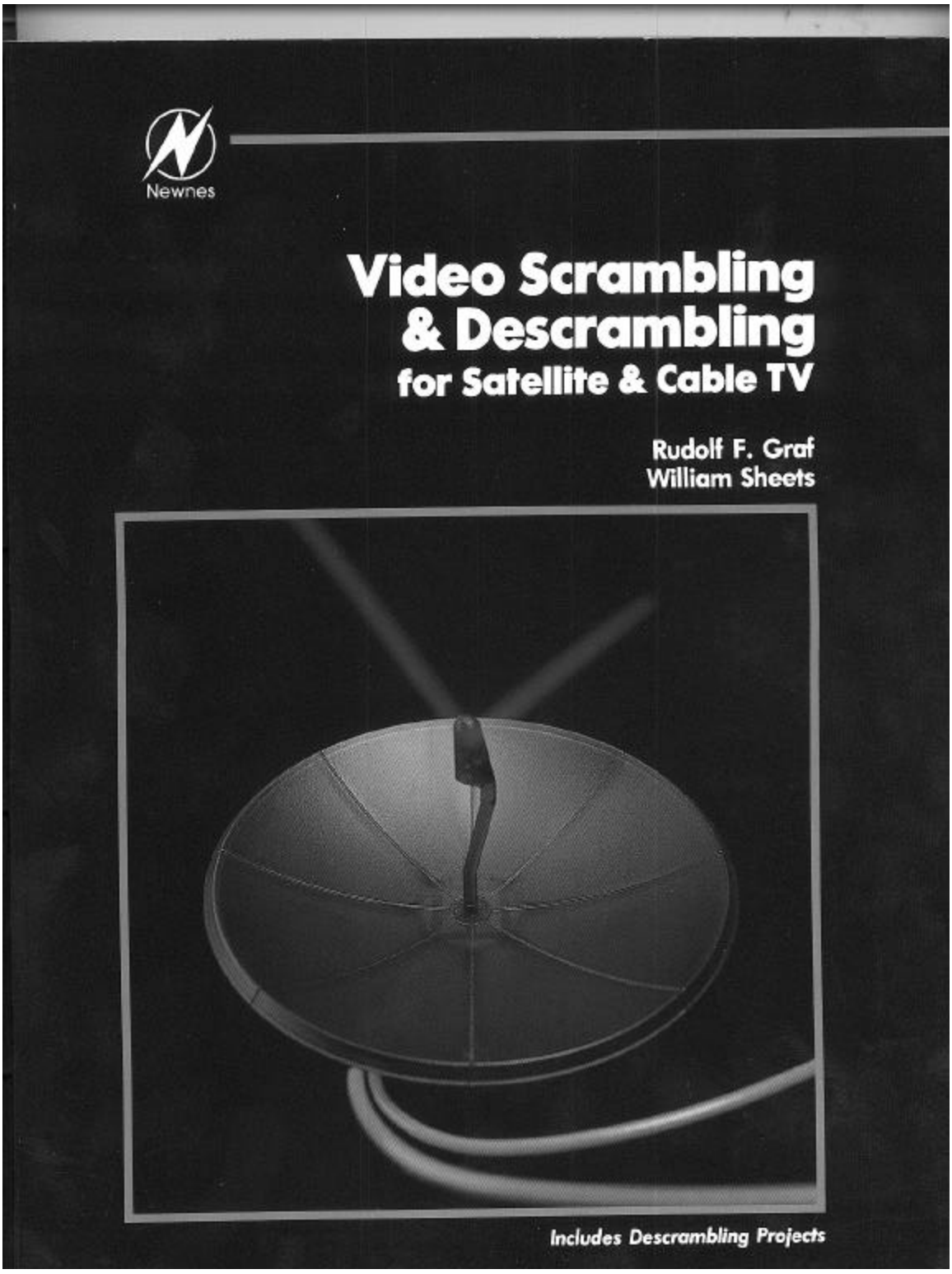

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Preface

Scrambling, a technique which has caused confusion, anxiety, rumors, and "doom and gloom" in the TVRO (television receive only) industry, is the subject of this book, and, hopefully, a lot of questions on the use of scramblers and the subject of scrambling will be answered.

We started kicking around the idea for this book early in 1985, partly out of curiosity, and partly for the opportunity to write a book, and slowly became aware of the need for such a book. Most of the material that seemed available was bits of information listed in the small, obscure advertisements on the back pages of several video and electronics magazines. Much research had to be done. Naturally, manufacturers of scrambling and descrambling equipment are not too eager to give out this information. Now and then, however, some articles on the subject were published, but they were few and far between. As more information was gathered, it became apparent that there was much duplication of data, and, therefore, increasingly difficult to get something new. Thus, we felt that there was a need for this book.

It has all the information that a videophile, TV technician, hobbyist, or anyone else interested in television scrambling would likely need, in one place, without spending several hundred dollars for all this "privileged" information. Most of the currently used methods (June 1986) are discussed, with the necessary technical background included. Since digital scrambling methods will undoubtedly supplant analog methods, we have included information on digital/analog conversion, phase-locked loops, digital techniques, and IC data sheets that the average reader might not be able to find easily without access to all the manufacturers' literature. Satellite scrambling is discussed in detail, and the U.S. patents on three satellite systems have been included for reference. Several representative decoders are discussed in detail, along with the construction details for several "typical" circuits.

This book should prove useful for the reader who wants to be "brought up to speed" on the subject of scrambling. It provides the basic background information needed to understand the subject, and assumes little or no previous knowledge of scrambling. We stress theory and circuit techniques, not specific decoders. When the reader becomes familiar with the theoretical concepts herein, he or she will have no trouble in understanding specific decoder models and modifications. It is better to know the "how and why" rather than just a few detailed specifics that are applicable in only limited cases.

We have also discussed some of the political and legal developments in force at the time of the writing of the book. This information may be somewhat dated by the time the book is published, but it makes for interesting reading. Many issues have yet to be resolved and new ones will surely come up.

The authors do not intend for this book to be a "video pirates manual." There are laws about the unauthorized viewing of pay-TV services and the use of illegal decoders. The information in this book is presented for experimental and educational purposes only. We make no guarantees of any kind whatsoever that the decoders described herein will perform in any way, or to any standard or performance level. The circuits are merely representative of practical decoders. We apologize, however, for any technical inaccuracies, contradictions, or errors. Much of our information has come from scattered sources and some of it had to be pieced together and clarified. A lot of material is presented which had to be rewritten or edited to fit this book.

We would like to thank all the companies and their personnel that provided us with technical assistance,

illustrations, and data sheets. Specifically, we thank M/A-COM LINKABIT, Inc., Scientific Atlanta, Oak Orion, Motorola, National Semiconductor, RCA, Fair-child, TRW, Intel, AT&T, and anyone that we may have forgotten.

We also extend our thanks and appreciation to our typist, Mrs. Stella Dillon, whose cooperation and skill at the word processor helped us produce the manuscript for this book in record time.

New developments are coming at a fast pace, and it is not easy to stop writing, and adding, but we have to call it a day somewhere. Thank you and enjoy the book.

RUDOLF F. GRAF AND WILLIAM SHEETS

Dedications

To my wife, Bettina, in appreciation for her patience and understanding.

RUDOLF F. GRAF

To my daughter, Suzanne, who has been anxiously waiting to see her daddy's book in print.

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Video Scrambling & Descrambling
for Satellite & Cable TV

If you have purchased or plan to purchase a satellite dish to capture signals coming from the many Earth-orbiting satellites, this book is for you.

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- The theory and techniques of video encryption and decryption
- An overview of the rules and regulations governing the availability and use of satellite signals, antennas, and programming materials
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This work is published for the commercial and hobbyist fields to increase the awareness of the many non-video opportunities in the satellite communications field. The publisher and the authors do not approve or condone the misuse of the information in this book, in any manner, by any individual, company, or group.

Rudolf F. Graf is the author of numerous books and articles on such subjects as mechanics, electricity, electronics, and automobiles. He is a graduate electronics engineer and received his MBA from New York University. In addition, he is a senior member of the IEEE, a licensed amateur radio and radiotelephone operator. His books include *Modern Dictionary of Electronics, Sixth Edition*, and *The Newnes Circuit Series*.

William Sheets lives in New York State and currently is chief engineer for a small electronics firm. He has more than twenty years experience in RF communications and digital circuitry. He has both a bachelor's and a master's degree in electrical engineering. His related interests include having built a satellite TV system, amateur radio equipment, and a computer.

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